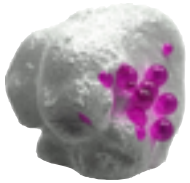


EvoDevo swarm

Environmental and genetic factors determine the differentiation of cells, as well as their proliferation, adhesion, migration, etc. Together these cellular and intercellular processes result in the development of organismal form, structure and functionality. In the EvoDevo-Swarm research project, we simulate developmental processes based on self-organised multi-agent models and physical interactions. We develop, test and refine tools for empirical developmental biologists to validate research hypotheses and to drive future empiric investigations.

floraRobotica

We develop reactive, agent-based plant-models for simulations of plant-robot interaction in the flora robotica project. The structures and processes that emerge can shape and re-define industrial and living spaces or increase agricultural yield. We model and simulate plant-robot hybrid systems and predict their future evolution. By means of augmented reality interfacing technologies, we push the boundaries of interactive design.

SOarch

Modelling & Optimisation of self-organising architectural construction is the goal of the soarch-project. It's based on principles of biological development and construction.

OCbotics

Individual robots, groups of robots and even swarms of robots are the subject of OCbotics. In this application-oriented research project, we build and optimise models for self-adjusting, coordinated robot activities.

OSOM

Self-organising system simulation typically comes at high computational costs, as each individual in the simulation may maintain a great number of interdependencies to its environment. Therefore, in order to scale the number of simulated units in our models, we have been working on automatically learning patterns of interactions and state evolution among individuals and apply the learned patterns to dynamically adjust the complexity of the system model.

Build on Course Work

If you happen to have taken a course that I am teaching, we can, of course, talk about defining research projects around topics and challenges presented in-class. If you have been pursuing a specific course project, we can always discuss how it could serve as a starting point for further research activities as well.

INTERACTIVE SELF-ORGANISATION

Organic Computing Research Projects Supervised by Dr. Sebastian von Mammen

INTERACTION.
VISUALISATION.
REPRESENTATION.
OPTIMISATION.
APPLICATION.

Simulation

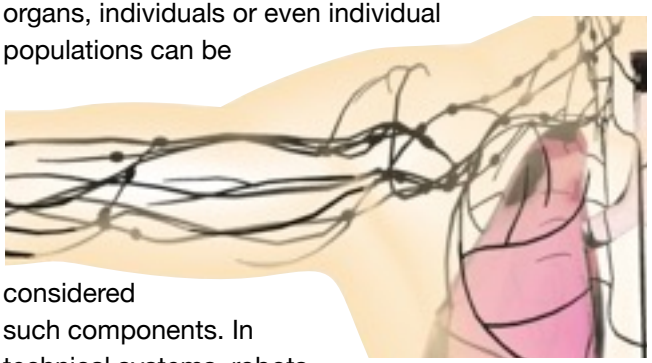
Digital computing has brought about countless innovations. It has, for instance, allowed us to predict the behaviours of complex systems by means of simulation.

Modelling

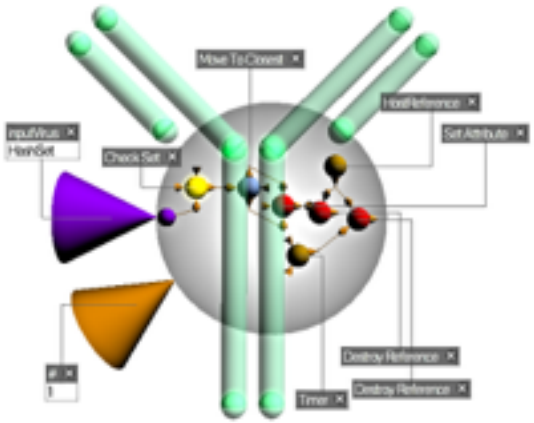
In order to run simulations of complex systems and to gain meaningful results, we need to design appropriate underlying models.

Organic Computing

Cities, communication networks, genetic regulatory networks - such complex systems can be understood as dynamically changing networks of interwoven, interacting components. In nature, proteins, cells, organs, individuals or even individual populations can be



considered such components. In technical systems, robots, smart cameras or other smart, interconnected objects are generally refered to as agents. Each of them acts based on its individual knowledge and goals. Organic Computing incorporates outstanding properties of biological and natural systems, such as their ability to learn and to adjust, into technical system designs.



HSY

Consider a swarm of drones searching for lost individuals in an alpine avalanche area or firefighter planes trying to extinguish large forest fires. Ideally, swarms of autonomous units would perform the given tasks as fast and successful as possible. But what if the environment is too complex to quickly make decisions? What if too many units malfunction? Human operators should always be offered the best possible interfaces to guide, navigate, inspect and control swarms. This is the research goal of Human-Swarm Interaction. We explore novel interfaces in playful interaction scenarios to find pragmatic solutions to this challenging goal.

INTO 3D

To master modelling of complex systems, to understand emergent processes, we have been devising a new visual programming framework that visualises objects and their behaviours in 3D.